Titanic Dataset - Data Cleaning & Exploratory Data Analysis (EDA)

Performing data cleaning and exploratory data analysis on the Titanic dataset.

In [3]:
```
# Import libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

%matplotlib inline

sns.set_style('whitegrid')
```

In [5]:
```
df = pd.read_csv('C:\\Users\\Shouvik\\Downloads\\titanic\\train.csv')
df.head()
```

Out[5]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500

In [7]:
```
df.tail()
```

Out[7]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.00
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.00
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.45
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.00
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.75

Dataset Overview

Let's explore the structure and summary of the Titanic dataset.

In [8]:
```python
# Basic info about the dataset
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Name         891 non-null    object 
 4   Sex          891 non-null    object 
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64  
 7   Parch        891 non-null    int64  
 8   Ticket       891 non-null    object 
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object 
 11  Embarked     889 non-null    object 
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

In [9]:
```
# Shape of the dataset (rows, columns)
print("\nShape:", df.shape)
```

```
Shape: (891, 12)
```

In [10]:
```
# Summary statistics
df.describe()
```

Out[10]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

In [11]:
```
# Missing values in each column
df.isnull().sum()
```

Out[11]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

Data Cleaning

We will handle missing values in `Age`, `Embarked`, and drop the `Cabin` column (too many (close to 75%) missing entries).

In [15]:
```
# Fill missing 'Age' with median
df.fillna({'Age': df['Age'].median()}, inplace=True)
```

In [17]:
```
# Fill missing 'Embarked' with mode
df.fillna(df['Embarked'].mode()[0], inplace=True)
```

In [18]:
```
# Drop 'Cabin' column
df.drop('Cabin', axis=1, inplace=True)
```

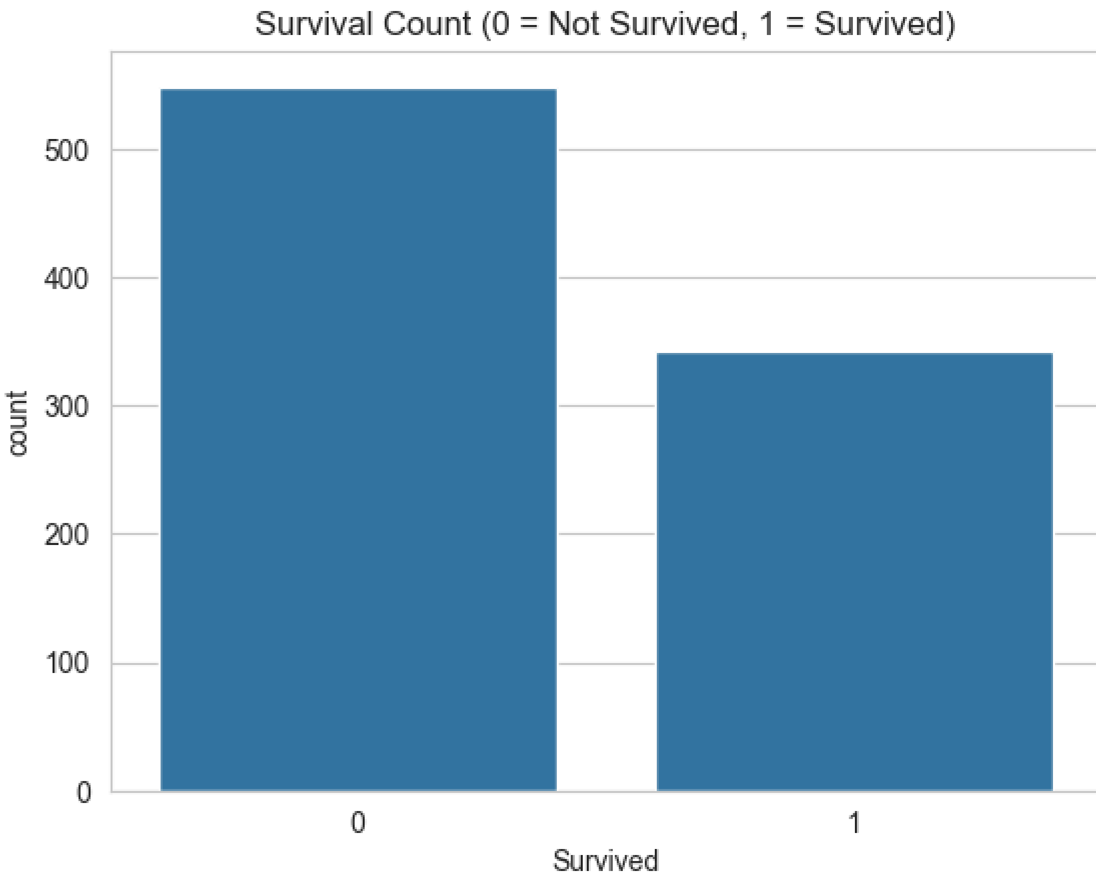
In [19]:
```
# Confirm missing values are handled
df.isnull().sum()
```

Out[19]:
```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Embarked       0
dtype: int64
```

Exploratory Data Analysis (EDA)

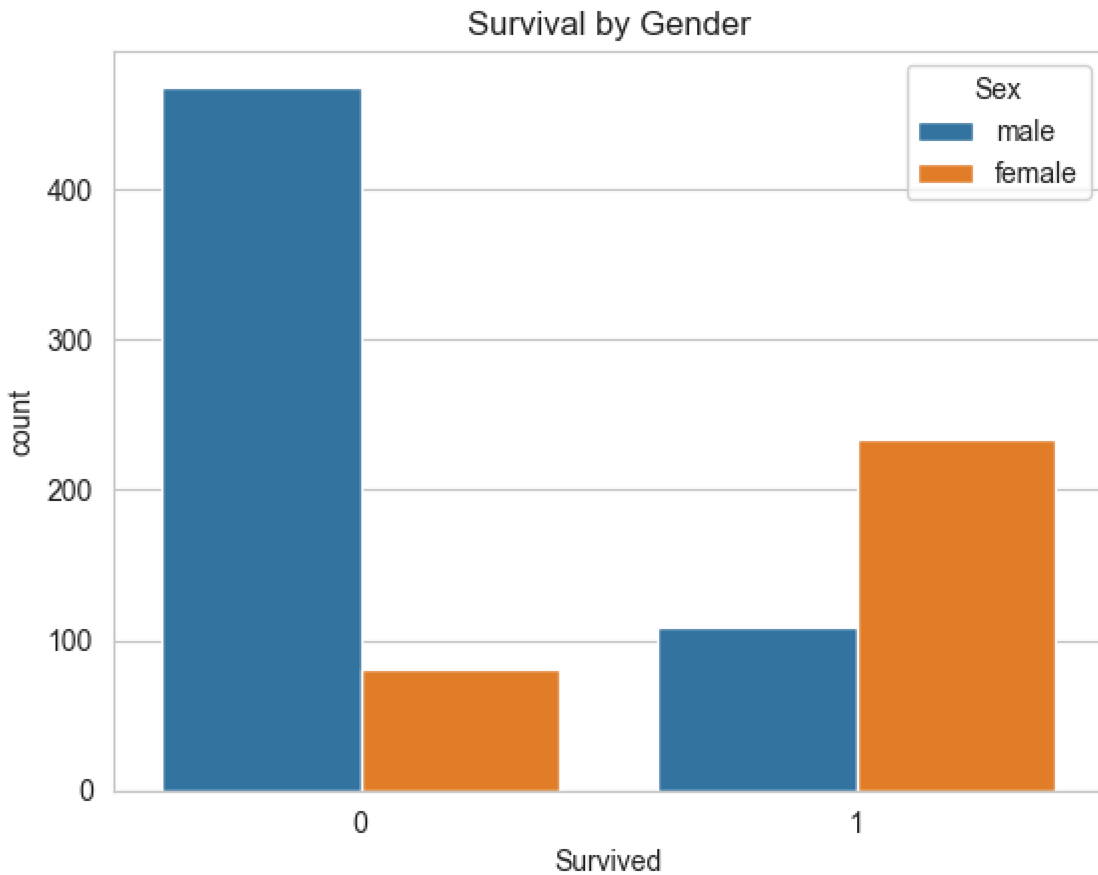
Let’s explore relationships and trends in the Titanic dataset.

In [20]:
```
# Survival count
sns.countplot(x='Survived', data=df)
plt.title('Survival Count (0 = Not Survived, 1 = Survived)')
plt.show()
```



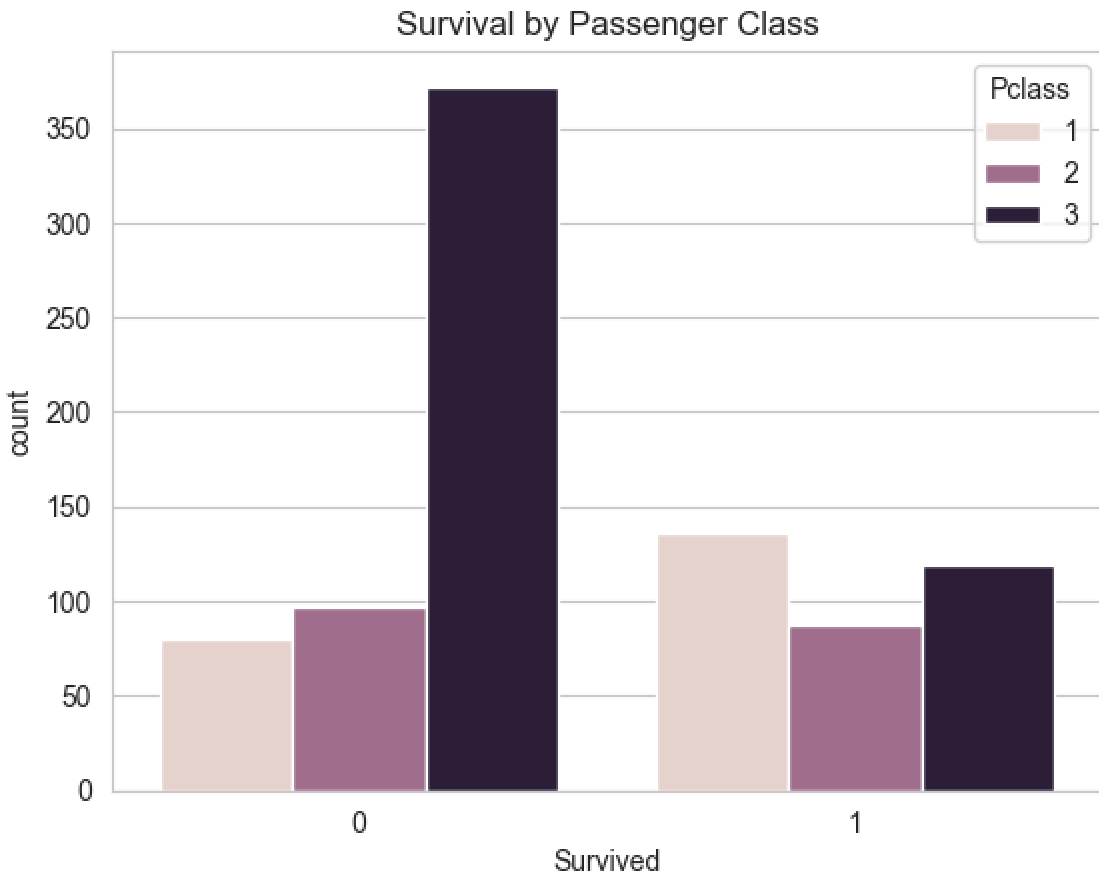
Survival by Gender

In [21]:
```
sns.countplot(x='Survived', hue='Sex', data=df)
plt.title('Survival by Gender')
plt.show()
```



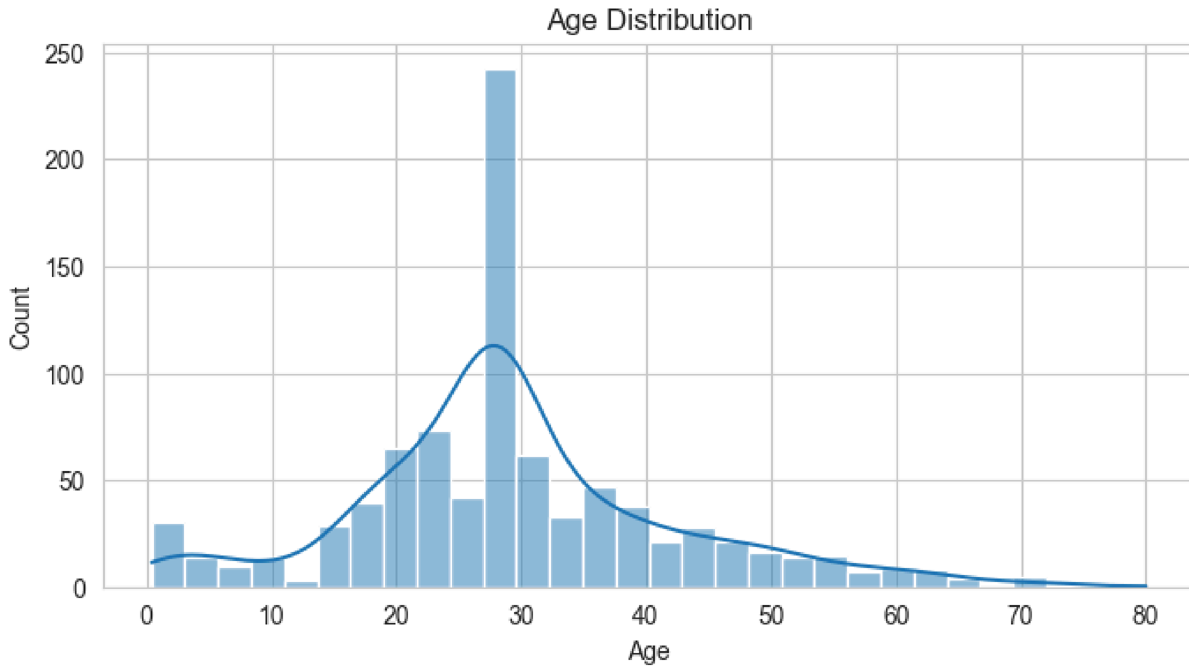
Survival by Passenger Class

In [22]:
```
sns.countplot(x='Survived', hue='Pclass', data=df)
plt.title('Survival by Passenger Class')
plt.show()
```



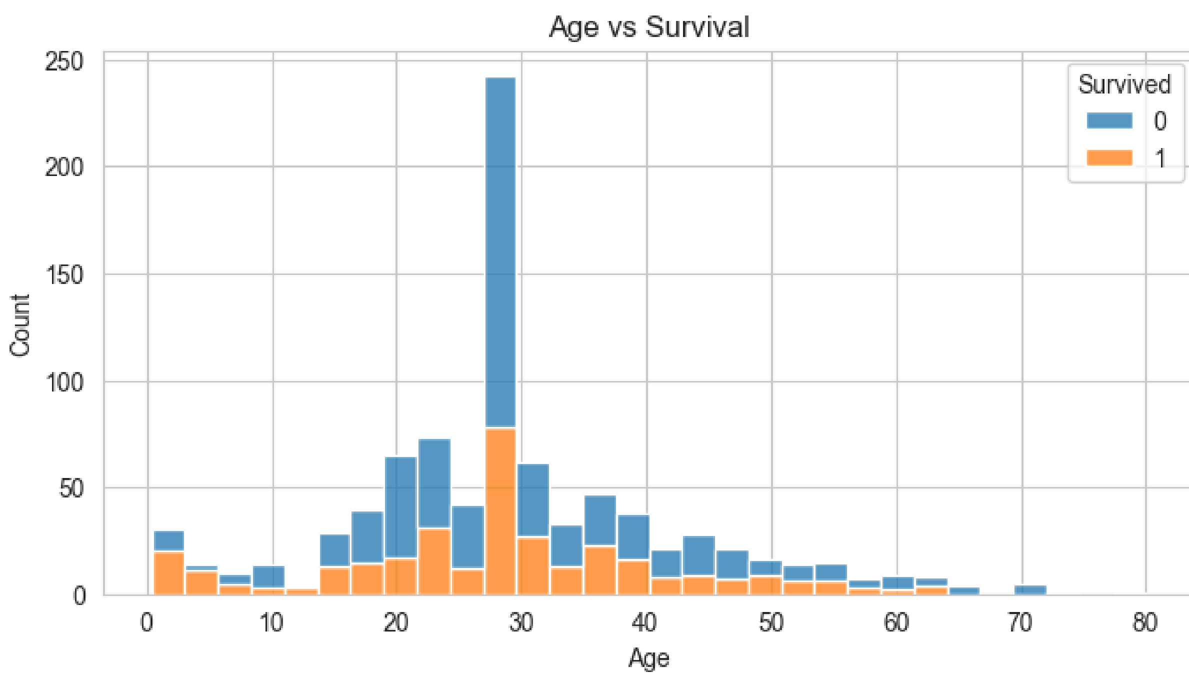
Age Distribution

In [23]:
```
plt.figure(figsize=(8,4))
sns.histplot(df['Age'], kde=True)
plt.title('Age Distribution')
plt.show()
```



Age vs Survival

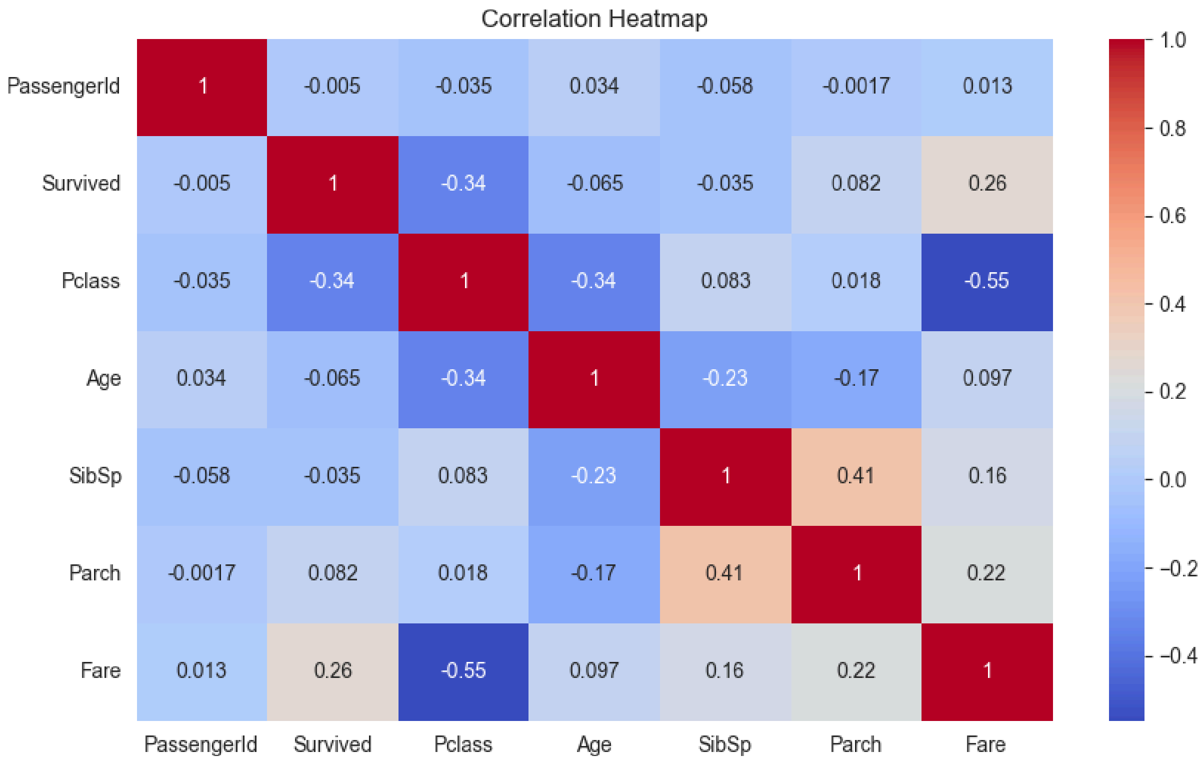
In [24]:
```
plt.figure(figsize=(8,4))
sns.histplot(data=df, x='Age', hue='Survived', multiple='stack')
plt.title('Age vs Survival')
plt.show()
```



Correlation Heatmap

In [28]:
```
plt.figure(figsize=(10,6))
sns.heatmap(df.corr(numeric_only=True), annot=True, cmap='coolwarm')
```

```
plt.title('Correlation Heatmap')
plt.show()
```



Observations & Insights

Based on the exploratory data analysis, here are the key insights from the Titanic dataset:

- **Gender:** Female passengers had a much higher survival rate than males. Women and children were prioritized during evacuation.
- **Passenger Class:** First-class passengers had significantly higher survival chances compared to second and third class.
- **Age:** There was a tendency for younger passengers to survive more, though it wasn't a strict rule.
- **Port of Embarkation (Embarked):** Passengers from Cherbourg (`C`) had slightly better survival outcomes than those from other ports.
- **Family (SibSp & Parch):** People with small families had slightly better survival, while those alone or with large families had lower survival.

These insights help understand the human and social dynamics behind the survival patterns during the Titanic disaster.

Final Note

This cleaned and analyzed dataset is now ready for further use — such as training a machine learning model for survival prediction.

In [27]:
```
# Save the cleaned data for further use
df.to_csv('titanic_cleaned.csv', index=False)
```